HITACHI
Inspire the Next

HITACHI 5200kW Wind Turbine

HTW5.2-127
HTW5.2-136

HITACHI 5200 kW Wind Turbines bring out more power from vast windy oceans. Ocean winds are stronger yet more unpredictable.

The technology of Hitachi 5200kW Downwind Turbine allows to efficiently harvest the power of the offshore winds.

Hitachi has upgraded HTW5.0-127 to produce 5,200kW. With HTW5.2-127 and HTW5.2-136, Hitachi is aiming for optimization of safety, less construction costs, and high performance for the projects in areas subject to tropical cyclone, high wind turbulence and lightning.
Two types of rotor diameter, 127m and 136m, are offered for 5200kW Wind Turbines.

HTW5.2-127 for High Wind Speed

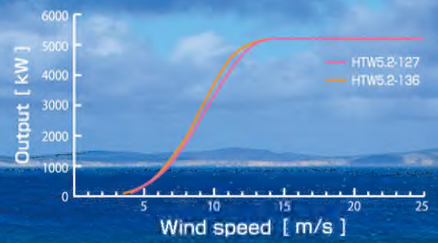
HTW5.2-127 offers maximized performance for the IEC Class I areas with technologies to acclimatized to tropical cyclone. HTW5.2-127 is certified as class T, extreme wind speed Vref,T=57 m/s.

* IEC : International Electrotechnical Commission

HTW5.2-136 for Moderate Wind Speed

HTW5.2-136 realizes more reliable performance in the areas of moderate wind speed such as IEC wind class III areas.

Power Curve



Lightning Protection System

HTW5.2-127 and 136 secure lightning protection for electric charge of 600C, which is above IEC standard. The major components withstand 95 percent of lightning strikes. The protection level exceeds the IEC Class I standards. For protection against induced lightning, electrical and control panels are equipped with Surge Protection Device in each Lightning Protection Zone.

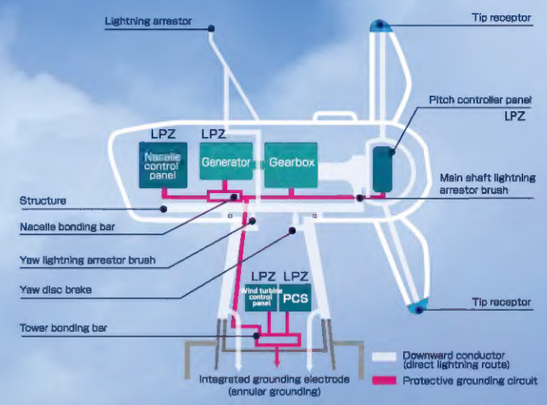
Protection level	Peak current [kA]	Particular energy [kJ/Ω]	Total electronical charge transfer [C]
IEC I	200	10,000	300
HTW5.2-127 HTW5.2-136	250	40,000	600

* The severity and frequency of a lightning strike cannot be forecasted as it is a natural phenomenon. The above description shall not apply to all cases.

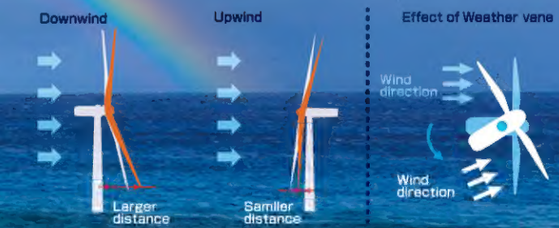
To ensure drive train reliability accelerated life tests on mechanical and electrical nacelle components are performed by adding complexed load.

Reliable Technologies of Downwind Rotor

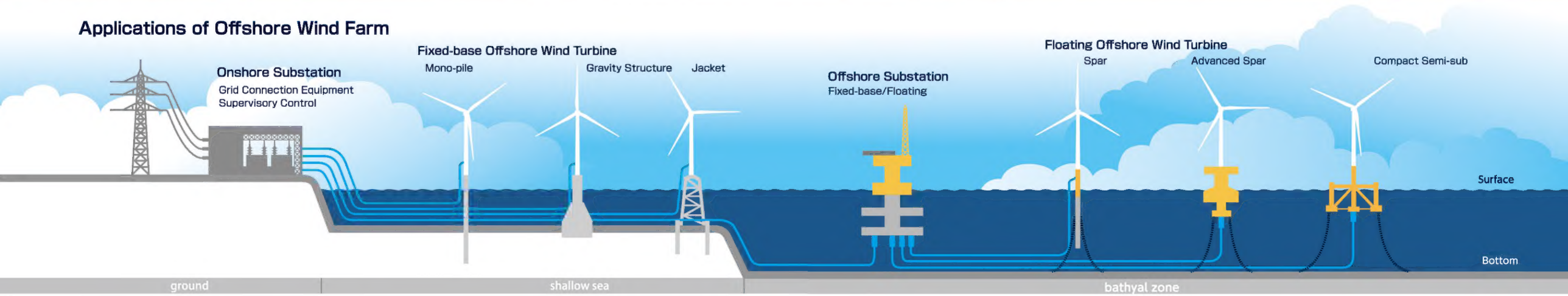
As is an inherent in the physics of a downwind configuration, the stronger the wind, the larger the clearance between the blades and the tower by blade flexion. This results in a lower probability of a tower hit. In case of stand still mode, downwind turbine switches to a free yaw operation mode and wards off the cross wind by the weather vane principle without yaw control even in case of black out conditions. This, in principle, reduces overturning moment to the foundation or floaters and maintains high degree of safety. That is important especially for offshore projects. Also, the wind sensors installed at the front of the blades give a more precise wind direction and speed in the upper stream. Yaw and blade pitch shall also be modulated to the right angle for more production.



Drive train accelerated life test (Courtesy of CENER, Spain)

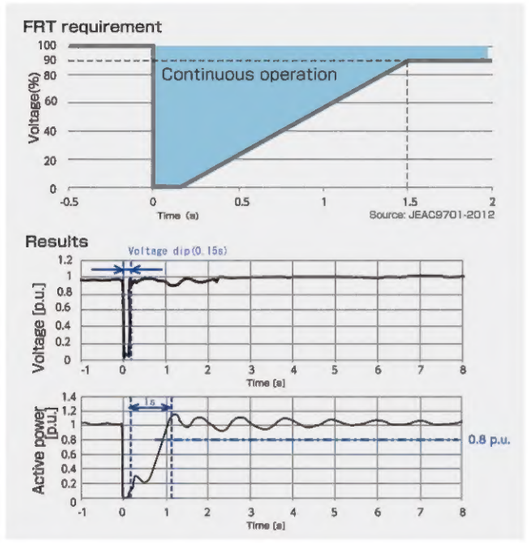


Applications of Offshore Wind Farm



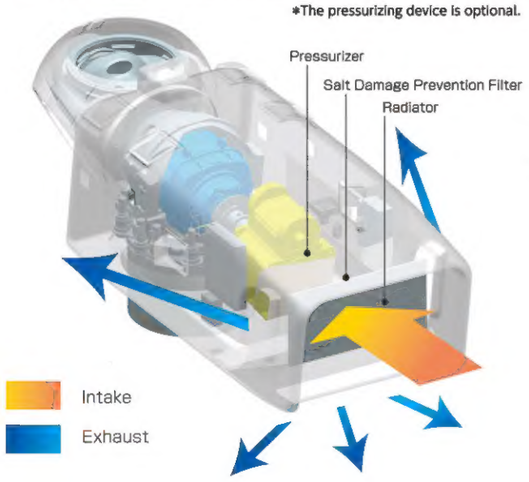
Fault Ride Through Verification

Hitachi wind turbines comply with FRT requirement regulated by Japanese Grid-interconnection Code (JEAC9701-2012). Turbines stay connected in short periods of voltage dip. Hitachi performed verification tests of the FRT function with the active power grid. The verifications for the other regions are in progress. *FRT : Fault Ride Through



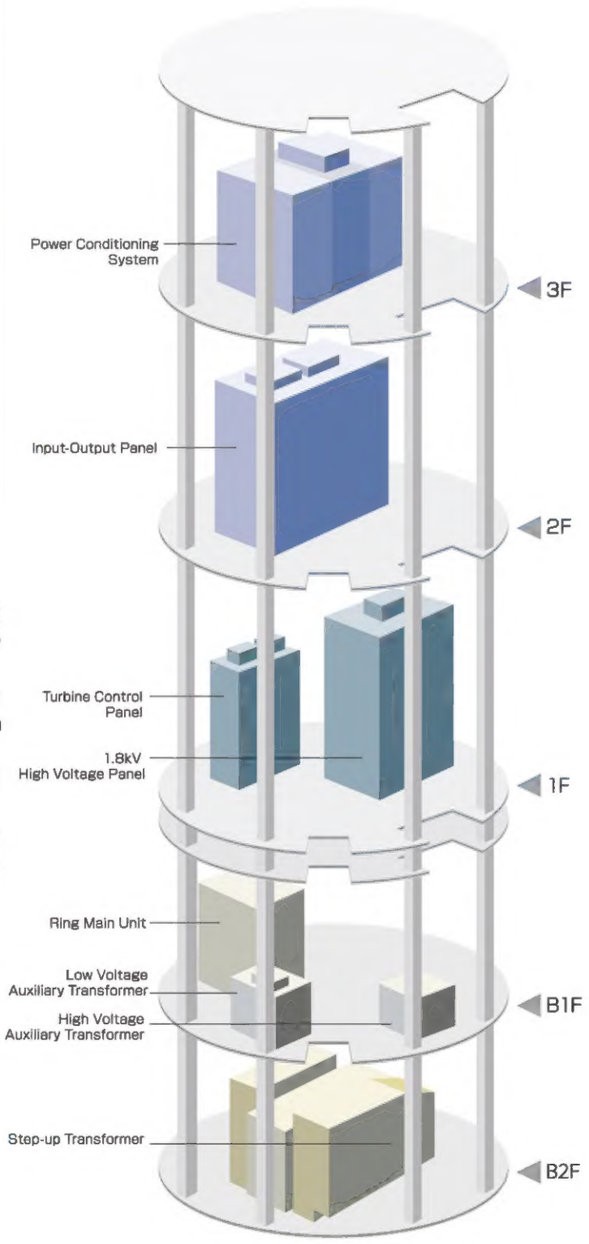
Advanced System Configuration

A forte of 5200kW Wind Turbine is the passive cooling system. The radiator located at the front of nacelle increases the effectiveness of the cooling.
The radiator exchanges the heat of the cooling water from the generator and gearbox efficiently with the fresh air caught in the upper stream at the front of nacelle.
The outside cooling air is exhausted to left-, right and lower sides of the nacelle, never entering the nacelle.
A pressurization device is provided as an option for the extra prevention of outside air entering into the turbine.
*The pressurizing device is optional.



Reliable Protection System and Structure

The steel monopole tower structure was designed with partitions to preserve the closed environment inside the electric module from humidity and airborne salt for installations in both offshore and onshore by the sea.



Electric equipment layout of a tower inside
(service lift is omitted)

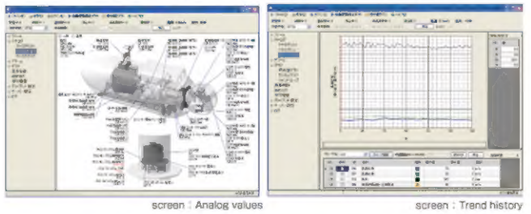
Pre-Engineering Service (Optional)

- Hitachi provides pre-engineering service for project feasibility studies such as, production simulation, measurement of wind speed, layout planning including wake analysis, logistic planning of equipment, etc.
- Hitachi supports for Construction Permission, application for grid connection, processes on Environmental Impact Assessment Law, etc.
- Hitachi provides assessments on fatigue analysis on the specific site, coupled interaction analysis of turbine and offshore foundation, etc.

Operation and Maintenance Service (Optional)

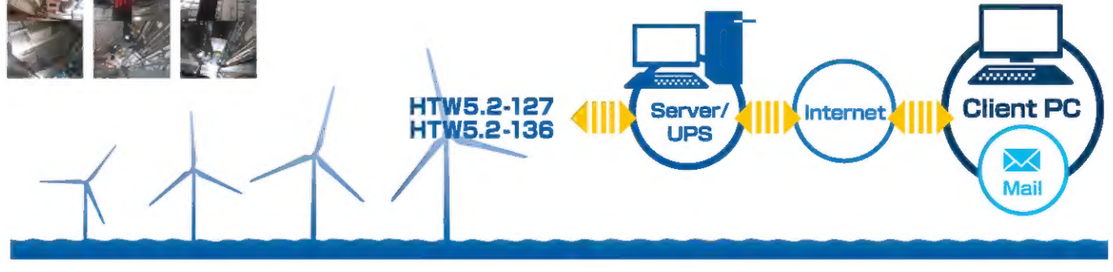
- Hitachi provides operation and maintenance service from the closest maintenance base including main parts supply storage.
- The turbines are remotely monitored 24hrs a day by SCADA system. For shorter downtime and optimal operation, Hitachi SCADA system enables operational data aquisition, equipment status report, alarming, sending notifications and the dispatching maintenance worker from the nearest maintenance base.
- For owners who decide to maintain Hitachi Wind Turbines by their own, Hitachi offers the original maintenance training program for the owner's workers at our Hitachi Wind Turbine Training Center (Hiwitt). The attendees are certified on the qualification upon completion of the original curriculum.

Image of the 24 hours remote monitoring system



screen : Analog values　　screen : Trend history

Web camera image(inside the turbine)



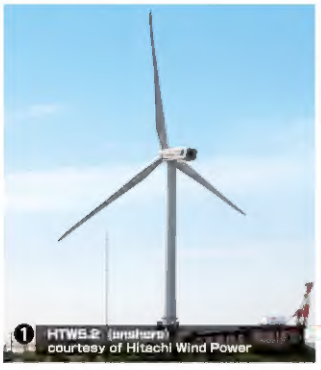
Specification

		HTW5.2-127	HTW5.2-136
Rotor	Rotor Diameter	127m	136m
	Swept Area	12,644m²	14,540m²
	Rotor Position	Downwind	
	Rotating Speed	6.4～12.7m⁻¹	
	Rated Rotating Speed	11.7min⁻¹	
	Rotating Direction	Clock-wise (from wind direction)	
Blades	No.of Blades	3	
	Length	62m	66.5m
	Material	GFRP	
Transmission	Gear Ratio	1 : 40 (approximately)	
Generator	Rated Power	5,200kW	
	Type	PMG	
	Power Conditioning System	Full Converter	
	Fault Ride Through	Standard	
Set-up Transformer	Output Voltage	33,000V / 1,800V	
Nacelle	Material	GFRP	
Tower	Type	Steel Monopole Tubular Tower	
	Hub Height	90m (minimum)	
	No. of Segments	3	
Brake System	Power Control	Pitch Control, Variable Speed	
	Cut-in wind speed	4m/s	3.5m/s
	Cut-out wind speed	25 m/s	
	Emergency Brake	Blade Feather (independently controlled) Disc Brake	
	Yaw control	Active Yaw(normal operation), Free Yaw(storm condition)	
Environmental Condition	Annual Average Wind Speed	10m/s	7.5m/s
	Wind Class(fatigue)	I	III
	Wind Class(extreme)	T	S
	Extreme Wind Speed (Vref,T)	57m/s	55m/s
	Turbulence Category	A	
	Operating Temperature	-20～40℃	
	Altitude	lower than 1,000m	

*The above information is therefore subject to change without prior notice.

Future Values ... (Optional)

- Hitachi's Power curve guarantee, Long Term Service Agreement (LTSA) and availability guarantee make the business more secured.
- Hitachi's predictive failure reporting service by distinctive algorithm and IoT technology streamlines the operation.
- Hitachi will launch wind farm control service for maximum total production. (near future.)



HTW Series Offshore Wind Farm Sites

❶ Kashima Port Fukashiba Wind Farm
(Ibaraki pref., HTW5.2 x 1, onshore)

❷ Sakiyama 2MW Floating Wind Turbine
(Former Floating Offshore Wind Turbine Demonstration Project, Ministry of the Environment.)
(Nagasaki, pref., HTW2.0 x 1, on a hybrid spar floater)

❹ Ministry of Economy, Trade and Industry
Fukushima Floating Offshore Wind Farm Demonstration Project
(Fukushima pref., HTW2.0 x 1, on a semi-sub floater,
HTW5.0 x 1, on an advanced spar floater,
25MVA substation on an advanced spar floater)

❸ Wind Power Kamisu Offshore Wind Farm No.1
(Ibaraki pref., HTW2.0 x 7, fixed)

Wind Power KAMISU offshore wind farm No.2
(Ibaraki pref., HTW2.0 x 8, fixed)

Hitachi, Ltd.

Power Business Unit

Renewable Energy Solutions Division

http://www.hitachi.com/products/power/wind-turbine/index.html

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